ACIDS/BASES

hydrochloric acid = HCl, strong
sulfuric acid = H_2SO_4, strong
nitric acid = HNO_3, strong
carbonic acid = H_2CO_3, weak
phosphoric acid = H_3PO_4, weak
ethanoic acid (acetic acid) = CH_3COOH, weak
sodium hydroxide = $NaOH$, strong ← group 1/2 hydroxides = strong
magnesium hydroxide = $Mg(OH)_2$, strong
sodium oxide = Na_2O
ammonia = NH_3, weak
sodium carbonate = Na_2CO_3, weak

ACID PRODUCES H IONS

e.g. $HCl \rightarrow H^+ + Cl^-$

BASE ~~ACID~~ PRODUCES HYDROXIDE IONS

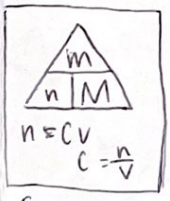
e.g. $NaOH \rightarrow Na^+ + OH^-$

ANIONS PRODUCED FROM ACIDS

Cl^- ← chloride from hydrochloric acid (HCl)
sulfate (SO_4^{2-}) from sulfuric acid (H_2SO_4)
nitrate (NO_3^-) from nitric acid (HNO_3)
phosphate (PO_4^{3-}) from phosphoric acid (H_3PO_4)
carbonate (CO_3^{2-}) from carbonic acid (H_2CO_3)
ethanoate (CH_3COO^-) from ethanoic acid (CH_3COOH)

REACTIONS OF ACIDS

acid + metal hydroxide → salt + H_2O
acid + metal oxide → salt + H_2O
acid + reactive metal → salt + H_2
acid + carbonate → salt + CO_2 + H_2O
acid + hydrogen carbonate → salt + CO_2 + H_2O



REACTIONS OF BASES

base (ie metal hydroxide or oxides) + acid → salt + H_2O
base + ammonium salts → salt + H_2O + NH_3

NON REACTIVE METALS

- copper
- aluminium
- silver
- gold
- mercury

EXAMPLES OF SALTS

- sodium nitrate
- calcium sulfate
- aluminium chloride
- magnesium acetate (or magnesium ethanoate)

INDICATORS

litmus paper

acidic: blue litmus → red
alkaline/baric: red litmus → blue
neutral: purple

phenolphthalein

acidic: colourless
basic: pink

bromothyl blue

acidic: yellow
neutral: green
basic: blue

universal indicator

red (ph < 3) = strong acid
orange/yellow (ph 3-6) = weak acid
green (ph 7) = neutral
blue (ph 8-11) = weak alkali
purple (ph > 11) = strong alkali

CONVERTING

e.g.	$mol\,L^{-1}$	$g\,L^{-1}$	ppm (solute / solvent)
H_2SO_4	= 2.0	= (2)(2+32+64) = 196	= 196,000 mg / 1 kg = 196×10^5

$mol/L \rightarrow grams/L = \times M$
$grams/L \rightarrow mol/L = \div M$
$ppm \rightarrow g/L = \div 1000$
$g/L \rightarrow ppm = \times 1000$
$ppm \rightarrow mol/L = \div 1000 \div M$
$mol/L \rightarrow ppm = \times 1000 \times M$

WATER

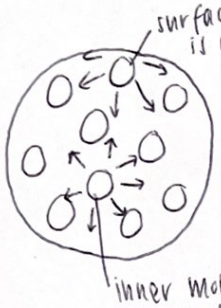
H_2O
- polar
- v-shaped
- main IMF = hydrogen bonding
  ↓
  between pos H and lone pairs on O atoms
  ↓
  relatively strong electrostatic attraction

PROPERTIES

high melting + boiling point
- H-bonds = hard to overcome unless enough energy is used
- potential for one H_2O to form up to 4 H-bonds with surrounding H_2O molecules. increases energy needed to overcome all the forces to turn H_2O from liquid → gas

density in solid + liquid phases
- water cools, molecules slow down
- arranged so each forms 4 H-bonds w/ adjacent H_2Os
- = ↑ space between molecules
  ∴ ↑ volume of ice
- ∴ ice = less dense than H_2O
  ∴ floats

surface tension



- resistance of a liquid to increase surface area
- H_2O has ↑ (relatively) surface tension
  ↳ due to strong IMF (H-bonds)
- H_2O molecules only form bonds w/ ~~above~~ below + next to them
- there is no/minimal force of attraction in outward direction
  ↳ cohesive forces > adhesive forces
  ↳ = net force pulling molecules down/in
- strong force = tendency to stay in shape, resisting disruptive forces
- = tension that makes the surface behave like a thin, stretched skin
  ↳ because H_2O molecules on the surface are so attracted to each other via strong H-bonds

other notes:
- cohesive particles
  ↳ the molecules all want to stick to each other, (helps explain surface tension)
- adhesive properties
  ↳ molecules stick to other surfaces
- ↑ heat capacity
  ↳ water takes a lot of energy before there is a change in temp. compared to other substances
- latent heat of vapourisation
  ↳ water needs a lot of PE to make a change from liquid → gas

SOLUTIONS

- solution = homogenous mixture (uniform composition)
- forms from solute + solvent
  ↑ in a smaller amount than solvent
- max. amount of solute = saturated
- less than ↗ then unsaturated
- more than max. = supersaturated
- aqueous solution is formed when a solid, liquid or gas dissolved in water (H_2O = solvent)

DISSOLUTION - PROCESS OF DISSOLVING